

WE CLAIM:

1. A method of controlling a failover process in a data storage system including a host, a host bus adapter, a communication fabric including data paths, and standby and active storage controllers, comprising:

5 detecting with the host bus adapter a failover condition;

responsive to the detecting, operating the host bus adapter to match the failover condition to a particular failover action in a failover rule set; and

10 performing with the host bus adapter the matched failover action.

2. The method of Claim 1, wherein the detecting, operating, and the failover action performing are completed without acts initiated by the host.

3. The method of Claim 2, wherein the detecting includes identifying a particular failure type and wherein the particular failover action is selected from an action subset corresponding to the particular failure type.

4. The method of Claim 3, wherein the failure type is selected from the group consisting of inter-controller link down, the active storage controller failed, the standby controller failed, an active path failed, and a standby path  
5 failed.

5. The method of Claim 1, further including prior to the performing, determining with the host bus adapter if all active paths have failed and if all active paths determined failed, skipping the failover action performing when the

5 host bus adapter determines either all other available paths have failed or a standby path is marked as unusable.

6. The method of Claim 1, further including after the failover action performing, operating the host bus adapter to initiate failback when a controller in a preferred slot is replaced, when the controller in the preferred slot is  
5 rebooted, and when unusable paths become usable.

7. The method of Claim 1, further including performing load distribution with the host bus adapter between the host and the controllers.

8. The method of Claim 1, further including enforcing with the host bus adapter anti-thrashing rules comprising preventing the performing from being completed more than set number of times per pre-set monitoring interval.

9. A host bus adapter for managing failover and failback processes within a data storage system having a host server, a communication fabric, at least one active storage controller, and at least one standby storage  
5 controller, comprising:

a connector linking the host bus adapter to a processor of the host server;

a port linking the host bus adapter to the communication fabric configured for transmitting and  
10 receiving digital information; and

a failover mechanism detecting a redundancy failure in the data storage system and in response, initiating failover actions.

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10. The host bus adapter of Claim 9, wherein the failover actions are selected by the failover mechanism from a failover rule set.

11. The host bus adapter of Claim 10, wherein the failover mechanism is further configured to determine at the time of the detecting, operating conditions within the data storage system, to determine whether the operating conditions match a set of failover conditions, and if matching, to select the failover action corresponding to the operating conditions.

12. The host bus adapter of Claim 11, wherein the failover conditions are specific to the detected redundancy failure.

13. The controller of Claim 9, wherein the failover mechanism presents a single logical unit number (LUN) entity to operating system device drivers in the host processor that is discoverable a plurality of times and wherein the failover actions are initiated without prior communication with the host processor.

14. A data storage system with redundant data storage, comprising:

a host computer device with a processor running operating system device drivers;

a communication fabric for carrying digital data signals;

an active controller controlling access by the host computer device to data storage devices;

10 a standby controller controlling access by the host  
computer device to the data storage devices; and

15 a host bus adapter linked to the host processor and the  
communication fabric for selecting a path through the  
communication fabric to one of the active and standby  
controllers for providing the operating system device  
drivers with access to the data storage devices, wherein  
host bus adapter is configured to initiate a failover action  
selected from a set of failover actions.

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5 15. The system of Claim 14, wherein the host bus  
adapter detects a potential failure in redundancy and  
determines whether to initiate the failover action by  
determining whether failover operating circumstances and  
failover operating conditions for the potential failure are  
satisfied.

5 16. The system of Claim 15, wherein the failover  
operating circumstances require when an active path in the  
communication fabric fails that at least one path to the  
controllers is available and that a path to the standby  
controller is usable.

17. The system of Claim 15, wherein the initiated  
failover action is selected from the set of failover actions  
based on existing ones of the failover operating conditions.

5 18. The system of Claim 14, wherein the data storage  
devices are grouped into subsets and wherein the host bus  
adapter is configured to perform the failover action for the  
subsets when a particular storage device within the subset  
requires the failover action.

19. The system of Claim 14, wherein the host bus adapter is adapted to initiate failover actions for a particular one or group of the data storage devices less than a preset number of times per monitoring interval.

20. The system of Claim 14, wherein the host bus adapter presents a single logical unit number (LUN) entity to each of the operating system device drivers that is discoverable multiple times.

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